CORRELATION OF MAP UNITS

MAP SYMBOLS

Fault—dashed where approximately located, dotted where concealed. Bar and ball on downthrown block; arrows

Thrust fault—Dashed where approximately located, dotted where concealed. Sawteeth on upthrown block

DESCRIPTION OF MAP UNITS

Alluvial deposits—Unconsolidated and poorly consolidated clay, silt, sand, and gravel, mainly in floodplains and

Mixed alluvium and terrace deposits—Unconsolidated and poorly consolidated clay, silt, sand, and gravel,

Wind-blown deposits—Clay- to silt-sized lake bed deposits occurring in dunes on the northeast or east (downwind)

Colluvium—Unconsolidated masses of rock fragments and soil material on relatively steep slopes with thickest

Qac Mixed alluvium and colluvium—Sand, silt, clay, and gravel deposited mainly along intermittent streams; includes

Alluvial fan deposits—Poorly sorted clay, silt, and gravel; crudely bedded to nonbedded. Appear to be active,

Terrace deposits—Beds of coarse sand and gravel with occasional boulders and lenses of silt and clay. Includes

Landslide deposits—Blocks of bedrock or loose slope debris; arrows point in the inferred direction of movement.

representing a transition zone between alluvium and terrace deposits, mainly adjacent to the Laramie River.

side of lakes and playa lakes. Also active and stabilized sand dunes east and south of Laramie, occurring in

slope wash and smaller alluvial fan deposits that coalesce with alluvium. Thickness approximately 0 to 50

receiving sediments from intermittent streams flowing off the Laramie and Medicine Bow Mountains. May have some debris flow component. Grade into terrace deposits near the Laramie River, Locally grade into

fragments of weathered granite and limestone cobbles, whose predominance varies depending on source of feeding stream. Occur along present drainages, a few feet (0.6 m) to over 40 feet (12 m) above modern flood

Many landslides occur in the Forelle Limestone, detaching at the contact with the underlying Satanka Shale

cobbles. Many are located in stream valleys immediately west of the Laramie fault, probably related to

erosion of gypsum beds of the lower Chugwater Formation that were brought to the surface or near surface by the Laramie fault. These deposits were mined for cement plaster in the Laramie area near the turn of the

century. Similar deposits occur in the southern and southeastern part of the Laramie Basin, also associated

debris flow component. Limestone cobbles are common. Includes boulders and cobbles of quartzite and other

Precambrian material on west side of map area. Currently inactive and dissected, often occurring as erosional

Limestone cobbles are common in those occurring on the east side of the Laramie Basin, while Precambrian

rocks predominate in those occurring on the west side of the basin. Often occur as erosional remnants ranging

from 20 to 300 feet (6 to 91 m) above present stream flood plains. Some remnants may actually be older

of gulches located near the upper reaches of Gilmore Gulch, southeast of Laramie. These perched dune

remnants, capped by cobble-sized lag gravels, occur in and are sourced by Casper Formation sandstones.

heterogeneous deposits of silt, sand, and gravel containing some cobbles and boulders, particularly near the

conglomerate in the Laramie Basin. In the Denver Basin, away from the Laramie Mountains, the formation is orange-gray claystone and siltstone with local and usually thin gray sandstone and conglomerate.

Conglomerates and arkoses are particularly abundant near the Laramie Mountains on both sides of the range. Thickness 0 to 500 feet (152 m) in the Denver Basin, 0 to 100 feet (30 m) in the Laramie Basin. Individual

members described below could not be distinguished on this quadrangle but are included here because they

Upper Conglomerate Member—Gray to brown to red, poorly to well-cemented conglomerate and

Brule Member—Pale pink to white argillaceous siltstone with local channel sandstone, limestone, claystone,

Chadron Member—Variegated tuffaceous and bentonitic claystone and siltstone, with channel sandstone

conglomerate. Upper part of the formation is a distinctive reddish maroon siltstone and claystone. Restricted

carbonaceous shale, coal and a basal conglomerate that contains giant quartzite boulders near the Medicine

Bow Mountains. Restricted to the Laramie Basin on this quadrangle. Thickness approximately 800 feet (244

and conglomerate. The lower part contains fluvial deposits. Thickness 0 to 700 feet (213 m)

Wind River Formation (upper Eocene)—Variegated claystone, shale, and arkosic sandstone with lenticular

Hanna Formation (Paleocene)—Mostly brown to gray coarse-grained arkosic sandstone, with siltstones, dark

sandstone with Paleozoic and Precambrian clasts, and matrix material of claystone, siltstone, and

sandstone. The member becomes more conglomeratic toward the Laramie Mountains. Thickness 0 to 300

Ogallala Formation (Miocene)—Light-colored, sometimes tuffaceous, unconsolidated to well-cemented

White River Formation (Oligocene)—White to pale pink blocky tuffaceous claystone and lenticular arkosic

Laramie Mountains. Restricted to the Denver Basin on this quadrangle. Thickness 0 to 330 feet (100 m)

Gypsite deposits—Unconsolidated clay-sized gypsum interbedded with red clay, sand, gravel, and limestone

Older alluvial fan deposits—Poorly sorted clay, silt, sand, and gravel; crudely bedded to nonbedded with some

remnants. Grade into older terrace deposits toward the Laramie River. Thickness 0 to 10 feet (3 m)

Wind-blown deposits (lower Pleistocene/Pliocene?) —Stabilized, eroded sand dune remnants perched on the sides

Older terrace deposits—Beds of coarse sand and gravel with occasional boulders and lenses of silt and clay.

indicate relative direction of oblique-slip movement. No indication on fault trace indicates undetermined

Formation contact—dashed where approximately located

Monocline— Showing direction of plunge; dashed where approximately located;

lowest stream terraces. Thickness approximately 0 to 50 feet (15 m)

and sourced by Casper Formation sandstones. Thickness 0 to 50 feet (15 m)

alluvium and colluvium. Thickness approximately 0 to 25 feet (8 m)

with faulting in the Chugwater Formation. Thickness 0 to 10 feet (3 m)

plains. Thickness approximately 0 to 10 feet (3 m)

alluvial fan remnants. Thickness 0 to 10 feet (3 m)

are mapped separately in other parts of the Denver Basin.

and volcanic ash. Thickness 0 to 450 feet (137 m)

to the Laramie Basin on this quadrangle. Thickness 400+ feet (122 m)

Quaternary and Tertiary surficial deposits

Thickness 0 to 100 feet (30 m)

Tertiary sedimentary rocks

short arrow denotes steeper dipping limb

Holocene surficial deposits

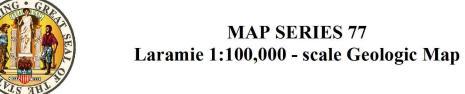
Anticline— Dashed where approximately located, dotted where concealed

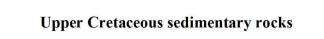
Thickness approximately 0 to 30 feet (9 m)

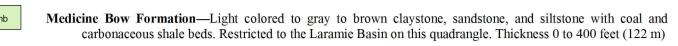
Playa lake deposits—Clay- to silt-sized stratified lake bed deposits

Holocene and Pleistocene surficial deposits

accumulations at the bases of slopes







sandstone can be friable, silty, or pyrite-bearing and the lower part can be finer-grained, very limy, and green. Thickness 190 to 250 feet (58 to 76 m). Only mapped separately on the east side of the Laramie Mountains.

Lewis Shale—Gray marine shale and siltstone with gray and brown lenticular sandstone beds; contains many concretions. Restricted to the Laramie Basin on this quadrangle, Thickness 2,200-2,600 feet (670 to 790 m)

Fox Hills Sandstone—Gray to yellow-brown sandstone that is sometimes interbedded with dark shale. The

some coal beds and carbonaceous shale in the upper part. Capped by the Pine Ridge Sandstone Member.

Niobrara Formation—Black or gray to yellow speckled, calcareous shale, and light-colored limestone and chalk.

Pierre Shale—Dark gray shale with thin to moderately thick, sometimes persistent sandstone beds. Restricted to the

Denver Basin on this quadrangle. Thickness about 5,700 feet (1,700 m) Mesaverde Formation—Gray to tan sandstone and interbedded dark gray to black siltstone and sandy shale, with

Steele Shale—Gray marine shale and siltstone, with numerous bentonite beds and thin lenticular sandstones, and some limestones. Restricted to the Laramie Basin on this quadrangle. Thickness 2,300 to 2,700 feet (700 to

Restricted to the Laramie Basin on this quadrangle. Thickness up to 1,600 feet (490 m)

Thickness approximately 325 to 700 feet (99 to 213 m). Thickest in the Laramie Basin Frontier Formation—Dark gray to black shale with interbedded thin, lenticular, tan to gray sandstones and thin bentonite beds. Persistent tan sandstone occurs at top of formation, locally referred to as the "Wall Creek Sandstone." Thickness approximately 550 feet (168 m)

Mowry Shale—Dark gray to black siliceous shale that weathers silver gray and contains thin bentonite beds and abundant fish scales. Thickness 80 to 150 feet (24 to 45 m). Thickness in the Laramie Basin

Upper and Lower Cretaceous sedimentary rocks Frontier Formation, Mowry Shale, Muddy Sandstone, and Thermopolis Shale, undivided

Mowry Shale, Muddy Sandstone, and Thermopolis Shale, undivided

Lower Cretaceous sedimentary rocks Muddy Sandstone—Tan to gray sandstone that is 20 to 100 feet (6 to 30 m) thick. Thinnest in the Laramie Basin. A black shale sequence was mapped with the Muddy Sandstone by Vargas (1974) in the southwest corner of

the map; elsewhere on the map, this sequence is mapped with the Mowry Shale Thermopolis Shale—Dark gray to black soft fissile shale that can contain thin partings of bentonite and sandstone. Ironstone concretions appear in the upper part of the formation. Fossil fish fragments occur locally in the

upper thin sandstones. Selenite crystals are common in outcrop. Thickness 60 to 100 feet (18 to 30 m) Cloverly Formation—Basal tan to white coarse-grained sandstone and chert pebble conglomerate, locally crossbedded and overlain by varigated buff and purple claystones interbedded with thin black shale beds, and an

upper gray to buff to brown, fine- to coarse-grained sandstone, cross-bedded in lower part. Thickness 100 to

Lower Cretaceous and Jurassic sedimentary rocks

Cloverly, Morrison, and Sundance formations, undivided

Jurassic sedimentary rocks

Morrison and Sundance formations undivided—Because the Sundance Formation is highly variable in thickness and may or may not be present over much of the quadrangle, it is mapped with the Morrison Formation where it is present. Total thickness 0 to 450 feet (137 m)

Morrison Formation (Upper Jurassic)—Pale-green, olive-green, blue-green to maroon, and chalky white sandstones. Limestone locally contains orange to brown chert inclusions. Thickness 130 to 300 feet (40 to 91

Sundance Formation (Upper and Middle Jurassic)—Variegated gray sandstone and siltstone, with greenish sandy shale in the lower part of the section. The formation is variably glauconitic, thins to less than 30 feet (9 m) on the south flank of the Laramie Basin, and may be very thin or absent in the eastern Laramie Basin. Mapped with the overlying Morrison Formation. Thickness 0 to 150 feet (46 m)

Triassic, Permian, and Pennsylvanian sedimentary rocks Jelm Formation (Upper Triassic)—Yellow to salmon pink massive sandstone, with large-scale cross-bedding,

interbedded with thin partings of red siltstone, claystone, and shale. This unit was mapped separately by Vargas (1974) and is only represented on the southwest corner of the map. Combined with the Chugwater Formation in several areas of structural complexity on the west edge of the map and in areas where only thin sandstone erosional outliers occur. Thickness ranges up to 125 feet (38 m), thinning rapidly to the east and pinching out on the east side of the Laramie Basin

Chugwater Formation, Forelle Limestone, and Satanka Shale, undivided

Chugwater Formation (Triassic and Permian)—Red shale and siltstone with interbedded red to salmon to buff, fine-grained sandstone. Lower part of section contains red shale interbedded with thin to thick gypsum beds, local solution breccia, and banded wavy gypsiferous thin limestone sometimes mistaken for part of the Forelle Limestone. This part of the Chugwater along with the underlying Forelle Limestone and Satanka Shale would be mapped as Goose Egg Formation west of the Laramie Basin. Includes the Jelm Formation in

several areas of structural complexity and where thin Jelm Formation sandstone erosional outliers occur. Thickness 650 to 800 feet (198 to 244 m) Forelle Limestone and Satanka Shale, undivided—Mapped in area of structural complexity on north side of Jelm

Mountain (western edge of quadrangle) Forelle Limestone (Permian)—Gray to purple, thin bedded, sparsely fossiliferous limestone locally interbedded with red siltstone and thin gypsum laminations. Wavy outcrops resembling algal structures common. Landslides are common on Forelle dip slopes with the unit detaching from the underlying Satanka Shale.

Thickness 10 to 30 feet (3 to 9 m) Satanka Shale (Permian)—Red siltstone and shale (often banded with white and ocher color zones), soft sandstone, thin limestones, and local gypsum beds, especially near the top. Buff to orange to red, fine-grained sandstone with ripple marks common near base of unit. Gypsum beds in the Satanka are currently being

mined in the Red Buttes area. Thickness 75 to 300 feet (23 to 91 m) Casper and Fountain formations, undivided

Casper Formation (Permian and Pennsylvanian)—Buff to reddish, calcareous to quartzitic, very fine- to coarse-grained, well-cemented subarkosic sandstone interbedded with buff to purplish-gray limestone and dolomite beds, usually micritic and locally fossiliferous. Sandstone often exhibits large-scale festoon crossbedding, increasing toward the south. As many as 10 different limestone or dolomite beds, which are locally quarried for cement or gravel uses, have been identified in the Laramie area. The Casper Formation serves as the prime aquifer in the Laramie area. Thickness 150 to 800 feet (46 to 244 m)

Fountain Formation (Pennsylvanian)—Coarse-grained pink to red to purple sandstone and arkose, with some conglomerates, siltstones, and shales. Interfingers with and underlies Casper Formation, thinning to the north

Devonian kimberlitic intrusive rocks

Kimberlitic diatremes—Porphyritic, brecciated, kimberlitic intrusive masses and dikes that sometimes contain diamonds. Xenoliths of Silurian and Orodovician limestone and dolomite, Precambrian crystalline rocks, peridotite, and eclogite are present in the diatremes

Middle Proterozoic crystalline rocks

Sherman Granite—Pink to orange, medium- to coarse-grained, biotite hornblende granite, syenogranite, quartz monzonite, and granodiorite. The Sherman Granite is gradational with or interfingers with the Laramie Mountains hornblende and pyroxene syenite. The Sherman Granite has been dated at 1,430 ±20 Ma (million years before present) by a Rb-Sr whole rock isochron (Zielinski and others, 1981)

and pinching out near the north edge of the map. Thickness 0 to 500 feet (152 m)

Sherman Granite and basalt mixed Sherman Granite border facies—Medium- and fine-grained porphyritic facies of the Sherman Granite. Mapped separately only in the southeastern part of the quadrangle

Sherman Granite inner cap rock phase—Pinkish-gray, porphyritic, biotite monzogranite (granite with equal amounts of alkali feldspar and plagioclase). Foliation defined by oriented, tabular, microcline phenocrysts;

biotite-rich streaks; and oriented, tabular inclusions. Mapped in the southern part of the quadrangle as part of the Virginia Dale ring structure Dioritic rocks of the Virginia Dale ring structure—Black to gray, medium-grained subophitic, ophitic, or

hypidiomorphic-granular diorite; composed of andesine, hornblende, biotite, quartz, and opaque minerals. Mapped in the southern part of the quadrangle as part of the Virginia Dale ring structure

Laramie Mountains hornblende and pyroxene syenite—Brown to black, coarse-grained, hornblende biotite syenite, quartz syenite, and monzonite. These rocks grade by occurrence of pyroxene into light brown to black, coarse grained, hornblende pyroxene syenite; by relative increase of plagioclase into noritic anorthosite; and by relative increase of quartz and microcline into Sherman Granite. Unit includes microcline porphyry syenite, pink leucocratic hornblende syenite dikes and sills that intrude metamorphic country rocks. Zircons from both major phases of the syenite define a single chord on a U-Pb concordia plot, indicating an age of 1,435+15 Ma. This syenite is part of what some geologists call the Laramie Anorthosite Complex

Laramie Mountains anorthosite and norite—White to light-bluish gray, medium- to coarse- grained, generally leucocratic anorthosite that is massive to layered to brecciated. A minor gray mafic anorthosite or norite commonly forms a gradational phase between syenites and the leucocratic anorthosite, or forms less resistant, more mafic layers in layered anorthosite. This unit commonly occurs as sharply bounded angular inclusions in the syenite, but as noted above is gradational into the syenite. This anorthosite is the bulk of what some geologists call the Laramie Anorthosite Complex. On the north end of the Laramie Mountains, this complex

has been subdivided into several units listed below, based on unpublished mapping by D.H. Lindsley of the State University of New York at Stony Brook

Chugwater Anorthosite Chugwater Anorthosite (An 1)

Chugwater Anorthosite (An 2)

King Mountain Anorthosite (An 3)

Upper Gabbroic Anorthosite

Middle Gabbroic Anorthosite

Lower Gabbroic Anorthosite

Early Proterozoic crystalline and metasedimentary rocks

Granitic rocks—Pink, medium- to coarse-grained granite. Very similar in composition to the Sherman Granite, although composed of a higher percentage of calcic plagioclase and lower percentage of potassium feldspar. Restricted to small exposures in the Medicine Bow Mountains (southwest corner of quadrangle) and Laramie Mountains. Other similar rocks have been dated at about 1,740 Ma in the Medicine Bow Mountains and 1,700 to 1,750 Ma in the Laramie Mountains (granite of the Duck Creek area)

Metasedimentary and metavolcanic rocks

southwest corner of the quadrangle

materials or preparing acknowledgements. Your cooperation is appreciated.

Laramie Mountains—Pelitic schist, marble, granite gneiss, layered amphibolite, and felsic gneiss. The Granite Village area in the southeastern Laramie Mountains area is mapped in much greater detail by Houston

Medicine Bow Mountains—Granite gneiss, felsic gneiss, amphibolite, hornblende gneiss, and amphibolite in

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Base map from U.S. Geological Survey 1:100,000 - scale Metric topographic map of the Laramie, Wyoming 30' x 60' Quadrangle, 1981 Projection: Universal Transverse Mercator (UTM), zone 13 Contour Interval 20 meters North American Datum of 1927 (NAD 27) 10.000-meter grid ticks: UTM, zone 13 50,000-foot grid ticks: Wyoming State Plane Coordinate System, East zone

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GEOLOGIC MAP OF THE LARAMIE 30' x 60' QUADRANGLE, ALBANY AND LARAMIE COUNTIES, SOUTHEASTERN WYOMING

UTM GRID CONVERGENCE (GN)

1981 MAGNETIC DECLINATION (MN) AT CENTER OF SHEET

DIAGRAM IS APPROXIMATE

mapped and compiled by Alan J. Ver Ploeg and Cynthia S. Boyd

kimberlite in the Laramie Range of southeastern Wyoming: Wyoming State Geological Survey

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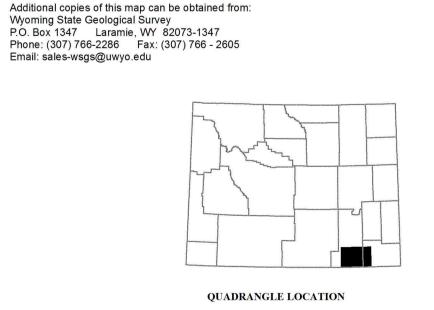
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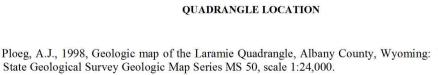
and 06HQAG0049. The views and conclusions contained in this report are those of the

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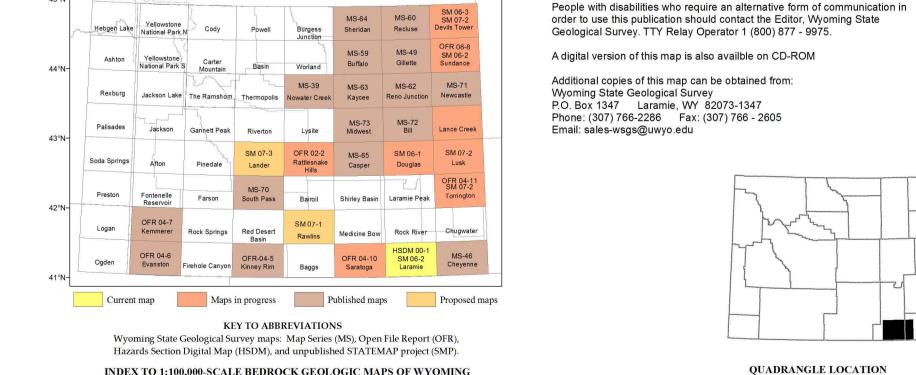


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